

**REMARKS/ARGUMENTS**

Favorable reconsideration of this application as presently amended is respectfully requested.

Claims 1-21 are presently pending in this application. Claims 5-11 and 19 have been withdrawn from consideration. Claims 1-4, 12, and 14-18 have been amended and new Claims 20 and 21 have been added to more clearly define the present invention without the introduction of any new matter. See the description of the channel region being located in a single crystal grain in the specification at page 19, lines 12-13, for example.

The outstanding Office Action includes a rejection of Claims 1, 2, 12, 13, 15, and 18 as being anticipated by Yamazaki et al. (U. S. Patent No. 5,962,869, Yamazaki '869) under 35 U.S.C. §102(b), a rejection of Claim 14 under 35 U.S.C. §103(a) as being unpatentable over Yamazaki '869 in view of Yamazaki et al. (U. S. Patent No. 6,492,659, Yamazaki '659), and a rejection of Claims 1, 3, 4, 12, 16, and 17 under 35 U.S.C. §103(a) as being unpatentable over Yamazaki et al. (US Published Application No. 2002/0038889, Yamazaki '889) in view of Yamazaki '869.

The examiner is thanked for meeting with Applicants representative on July 6, 2005, to discuss a modification to independent Claims 1, 12, and 18 to emphasize the attainment of a "small stacking fault density." The Examiner noted that Figure 5 of the application indicated to him that stacking fault density was a function of both carbon concentration and oxygen concentration and would inherently be "small" if the levels of carbon concentration and oxygen concentration were in the range indicated in FIG. 5 and in Yamazaki '869.

Applicants have amended Claims 1, 12, and 18 to further clarify that the claimed levels of carbon and oxygen concentration occur in "a non-single-crystal semiconductor film including a single-crystal grain in which a channel region for an active device is located" (Claim 1) or that there is "an active device having a channel region located within a single-

crystal grain of the non-single-crystal semiconductor film (Claims 12 and 18), subject matter with clear support in the specification as noted above (e.g., at page 19, lines 12-13).

Before considering the prior art based rejections, it is believed that a brief review of the presently claimed invention and its advantages would be helpful. In this regard, the claimed invention includes at least an oxygen concentration in the channel region that is no higher than  $1 \times 10^{18}$  atoms/cm<sup>3</sup> and requires a the channel region to be in a single-crystal grain. Base independent Claims 1 and 12 also require a carbon concentration that is the same as the oxygen concentration while Claim 18 requires a small stacking fault density no higher than  $1 \times 10^6$  cm<sup>-3</sup>.

In light of these oxygen and carbon concentrations and resulting small stacking fault density, the current carrying property of the channel region is not significantly degraded due to the stacking fault density. Furthermore, the above-noted oxygen concentration makes it easier to dispose a channel region having a channel length of 2  $\mu$ m in a single-crystal grain that avoids the presence of grain boundaries in the channel region, where the presence of grain boundaries will further degrade the current carrying property of the channel region.

Thus, the present invention provides for a small stacking fault density and avoids the presence of grain boundaries in the channel region to improve the current carrying property of the channel region.

Turning to the rejection of Claims 1, 2, 12, 13, 15, and 18 as being anticipated by Yamazaki '869 under 35 U.S.C. §102(b), it is noted that Yamazaki '869 does not disclose or suggest locating the channel region within a single-crystal grain. The laser annealing taught by Yamazaki '869 would also not inherently result in the production of a single-crystal grain channel region.

In this last respect, it is noted that the laser annealing process taught by Yamazaki '869 includes no suggestion as to any laser beam irradiating technique to use for annealing

and certainly does not teach or suggest the use of a phase shifter as used to produce annealing in the present application. Note the specification description of annealing starting at page 34, line 22, and discussing the use of the phase shifter in detail starting at page 35, line 17. The importance of the temperature gradient thus established to the growth of a suitably large crystal grain (to a larger than normal size) is then discussed at page 37, lines 3-11. Without some technique to insure growth of such larger grains, merely annealing using a laser beam provides no surety that any single-crystal grains actually produced will be of sufficiently large size to have a channel region formed therein.

Moreover, to whatever extent that Yamazaki '869 includes teachings of reduced oxygen density, it includes no teaching of the claimed reduced oxygen concentration (no higher than  $1 \times 10^{18}$  atoms/cm<sup>3</sup>) providing stable growth of larger than normal crystal grains as compared to crystal grain sizes resulting from more standard laser annealing approaches.

In addition, it is noted that Yamazaki '869 includes teachings of carbon, nitrogen and oxygen concentrations as high as  $5 \times 10^{19}$  atoms/cm<sup>3</sup> and a preferred concentration of  $1 \times 10^{19}$  atoms/cm<sup>3</sup> note the abstract, for example. Thus, while lower concentrations (or lower) are suggested, and an example of oxygen, nitrogen and carbon is indicated to be as low as  $1 \times 10^{16}$  atoms/cm<sup>3</sup> is noted at col. 12, lines 59-62 (noted at page 3, line 6 of the outstanding Action), the range taught to be preferred is  $1 \times 10^{19}$  atoms/cm<sup>3</sup> to  $5 \times 10^{19}$  atoms/cm<sup>3</sup> and this preferred range certainly does not inherently result in the "small" fault density taught here to be tolerable ((i.e.  $1 \times 10^6$ /cm<sup>3</sup>).

In any event, even if the suggestions of Yamazaki '869 as to "lower" (lower than the preferred ranges) concentrations of oxygen, nitrogen, and carbon were to have been adopted by the artisan, there is nothing taught or suggested by Yamazaki '869 that would have

reasonably further suggested that the oxygen concentration being no higher than  $1 \times 10^{18}$  cm<sup>3</sup> was needed to facilitate forming a larger than normal crystal grain that could hold a channel region using laser annealing with a phase shifter or any other temperature gradient establishing technique.

Accordingly, the rejection of independent Claims 1, 12 and 18 as being anticipated by Yamazaki '869 under 35 U.S.C. §102(b) is traversed.

In addition as Claim 2 depends on base independent Claim 1 and Claims 13 and 15 depend on base independent Claim 12, these dependent claims include all the limitations of their respectively noted base independent claim and patentably define over Yamazaki '869 for at least the same above noted reasons. Moreover, as each of these dependent Claims 2, 13, and 15 add further features not taught or suggested by Yamazaki '869, these dependent claims further patentably define over Yamazaki '869 for this reason as well.

With further regard to the rejection of Claim 14 under 35 U.S.C. §103(a) as being unpatentable over Yamazaki '869 in view of Yamazaki '659 and the rejection of Claims 1, 3, 4, 12, 16, and 17 under 35 U.S.C. §103(a) as being unpatentable over Yamazaki '889 in view of Yamazaki '869, and newly presented Claim 20 dependent on independent base Claim 12 and Claim 21 dependent on independent base Claim 18, it is noted that neither Yamazaki '659 nor Yamazaki '889 cure the above noted deficiencies of Yamazaki '869. Thus, base independent Claims 1, 12, and 18, dependent Claims 3, 4, 14, 16, and 17, and new dependent Claims 20 and 21 all clearly patentably define over Yamazaki '869, Yamazaki '659 and/or Yamazaki '889 considered alone or together in any proper combination for at least the reasons noted above.

Moreover, as each of these dependent Claims 3, 4, 14, 16, and 17 and new dependent Claims 20 and 21 add further features not taught or suggested by Yamazaki '869, Yamazaki '659, and/or Yamazaki '889 considered alone or together in any proper combination, these

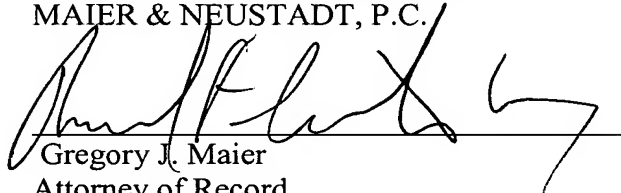
Application No. 10/722,486  
Reply to Office Action of 04/13/2005

dependent claims and new dependent claims further patenably define over Yamazaki '869, Yamazaki '659, and/or Yamazaki '889 considered alone or together in any proper combination, for this reason as well.

As no other issues are believed to remain outstanding relative to this application, it is believed to be clear that this application is in condition for formal allowance and an early and favorable action to this effect is, therefore, respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.

A handwritten signature in black ink, appearing to read 'Gregory J. Maier', is written over a horizontal line.

Gregory J. Maier  
Attorney of Record  
Registration No. 25,599

Customer Number  
**22850**

Tel: (703) 413-3000  
Fax: (703) 413 -2220  
(OSMMN 06/04)

Raymond F. Cardillo, Jr.  
Registration No. 40,440